What is claimed is

1. A fast inverse discrete transform method comprising:

(a) searching all elements of a discrete cosine transform (DCT) matrix in a predetermined order for non-zero elements; and

(b) calculating a restored value of each element of a restoration matrix, by 2 dimensional-inverse DCT (2D-IDCT) transforming the non-zero elements of the DCT matrix by using a symmetry of an IDCT formula.

2. The method of claim 1, wherein the predetermined order comprises an order following a zigzag path starting from an element located in a first row and a first column of the DCT matrix.

3. The method of claim 1, wherein the step (b) comprises:

(b1) calculating and storing reference values of each non-zero element of the restoration matrix by inputting coordinate values of non-zero elements and coordinate values of reference elements determined according to the symmetry of the IDCT formula among the elements of the restoration matrix, in the IDCT formula, in which the coordinate values of non-zero elements are input; and

(b2) obtaining the restored value of each element of the restoration matrix, by adding iteratively the stored reference values to the values of respective elements of the restoration matrix according to a type of symmetry with respect to the coordinate values of the reference elements.

4.   The method of claim 3, wherein the step (b1) comprises:

(b11) calculating and storing a first reference value, if coordinate values of a first non-zero element are the first row and the first column, by inputting coordinate values of a first reference element determined to be an element of the first row and the first column in the IDCT formula;

(b12) calculating and storing a second reference value column, if the coordinate values of the first non-zero element are an arbitrary row and the first column, excluding the first row and the first column, by inputting coordinate values of reference elements determined to be the elements of the arbitrary row and the first column in the IDCT formula; and

(b13) calculating and storing a third reference value row, if the coordinate values of the first non-zero element are the first row and an arbitrary column, excluding the first row and the first column, by inputting coordinate values of reference elements determined to be the elements of the first row and the arbitrary column in the IDCT formula.

5.   The method of claim 4, wherein the step (b1) further comprises:

(b14) calculating and storing a fourth reference value matrix, if the coordinate values of the first non-zero element are coordinate values of elements having A-type symmetry, by inputting coordinate values of reference elements determined to be the elements of a first quadrant in the IDCT formula;

(b15) calculating and storing a fifth reference value matrix, if the coordinate values of the first non-zero element are coordinate values of elements having B-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula;

(b16) calculating and storing a sixth reference value, if the coordinate values of the first non-zero element are coordinate values of elements having C-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula; and

(b17) calculating and storing a seventh reference value, if the coordinate values of the first non-zero element are coordinate values of elements having D-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula.

6. The method of claim 5, wherein the step (b2) comprises:

(b21) initializing the value of each element of the restoration matrix with the stored first reference value;

(b22) adding the stored second reference value column to the elements of each column of the restoration matrix; and

(b23) adding the stored third reference value row to the elements of each row of the restoration matrix.

7.   The method of claim 6, wherein the step (b2) further comprises:

(b24) according to the A-type symmetry, adding the stored fourth reference value matrix to the elements of a first quadrant of the restoration matrix without change, adding to the elements of a second quadrant of the restoration matrix after horizontally reversing the reference value matrix, adding to the elements of a third quadrant of the restoration matrix after vertically reversing the reference value matrix, and adding to the elements of a fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees;

(b25) according to the B-type symmetry, adding the stored fifth reference value matrix to the elements of the first quadrant of the restoration matrix without change, adding to the elements of the second quadrant of the restoration matrix after horizontally reversing the reference value matrix and inverting the signs, adding to the elements of the third quadrant of the restoration matrix after vertically reversing the reference value matrix, and adding to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees and inverting the signs;

(b26) according to the C-type symmetry, adding the stored sixth reference value matrix to the elements of the first quadrant of the restoration matrix without change, adding to the elements of the second quadrant of the restoration matrix after horizontally reversing the reference value matrix, adding to the elements of the third quadrant of the restoration matrix after

vertically reversing the reference value matrix and inverting the signs, and adding to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees and inverting the signs; and

(b27) according to the D-type symmetry, adding the stored seventh reference value matrix to the elements of the first quadrant of the restoration matrix without change, adding to the elements of the second quadrant of the restoration matrix after horizontally reversing the reference value matrix and inverting the signs, adding to the elements of the third quadrant of the restoration matrix after vertically reversing the reference value matrix and inverting the signs, and adding to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees.

8.   The method of claim 7, wherein excluding the first row or the first column of the restoration matrix, the elements included in the even-numbered rows have the D-type symmetry and the C-type symmetry in turn continuously and repeatedly, and the elements included in the odd-numbered rows have the B-type symmetry and the A-type symmetry in turn continuously and repeatedly.

9.   A fast inverse discrete cosine transform (IDCT) apparatus comprising:

an element search unit which searches all elements of a discrete cosine transform (DCT) matrix in a predetermined order for non-zero elements; and

an individual element 2 dimensional (2D)-inverse DCT (IDCT) unit which calculates a restored value of each element of a restoration matrix, by 2D-IDCT transforming the non-zero elements of the DCT matrix from the element search unit, by using a symmetry of an IDCT formula.

10. The apparatus of claim 9, wherein the predetermined order comprises an order following a zigzag path starting from an element located in a first row and a first column of the DCT matrix.

11. The apparatus of claim 9, wherein the individual element 2D-IDCT unit comprises:

a reference value computation storage unit which calculates and stores reference values of each non-zero element of the restoration matrix, by inputting coordinate values of the non-zero elements and coordinate values of reference elements determined according to the symmetry of the IDCT formula among the elements of the restoration matrix, in the IDCT formula, in which the coordinate values of the non-zero elements are searched for by the element search unit; and

a reference value iterative addition unit which obtains the restored value of each element of the restoration matrix, by adding iteratively the reference values stored in the reference value computation and storage unit to the values of respective elements of the restoration matrix according to a type of symmetry with respect to the coordinate values of the reference elements.

12. The apparatus of claim 11, wherein the reference value computation storage unit comprises:

a first reference value computation storage unit which calculates and stores a first reference value if the coordinate values of a first non-zero element are the first row and the first column, by inputting the coordinate values of a reference element determined to be an element of the first row and the first column in the IDCT formula;

a second reference value column computation storage unit which calculates and stores a second reference value column if the coordinate values of the first non-zero element are an arbitrary row and the first column, excluding the first row and first column, by inputting the coordinate values of reference elements determined to be the elements of the arbitrary row and the first column in the IDCT formula; and

a third reference value column computation storage unit which calculates and stores a third reference value row if the coordinate values of the first non-zero element are the first row and an arbitrary column, excluding the first row and the first column, by inputting the coordinate values of reference elements determined to be the elements of the first row and the arbitrary column in the IDCT formula.

13. The apparatus of claim 12, wherein the reference value computation storage unit further comprises:

a fourth reference value computation storage unit which calculates and stores a fourth reference value matrix if the coordinate values of the first non-zero element are the coordinate values of elements having A-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of a first quadrant in the IDCT formula;

a fifth reference value computation storage unit which calculates and stores a fifth reference value matrix if the coordinate values of the first non-zero element are the coordinate values of elements having B-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula;

a sixth reference value computation storage unit which calculates and stores a sixth reference value matrix if the coordinate values of the first non-zero element are the coordinate values of elements having C-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula; and

a seventh reference value computation storage unit which calculates and stores a seventh reference value matrix if the coordinate values of the first non-zero element are the coordinate values of elements having D-type symmetry, by inputting the coordinate values of reference elements determined to be the elements of the first quadrant in the IDCT formula.

14.   The apparatus of claim 13, wherein the reference value iterative addition unit comprises:

a first reference value initialization unit which initializes the value of each element of the restoration matrix with the first reference value stored in the first reference value computation storage unit;

a second reference value column addition unit which adds the second reference value column stored in the second reference value column computation storage unit to the elements of each column of the restoration matrix; and

a third reference value row addition unit which adds the third reference value row stored in the third reference value row computation storage unit to the elements of each row of the restoration matrix.

15.   The apparatus of claim 14, wherein the reference value iterative addition unit further comprises:

a fourth reference value matrix addition unit which, according to the A-type symmetry, adds the fourth reference value matrix stored in the fourth reference value matrix computation storage unit to the elements of a first quadrant of the restoration matrix without change, to the elements of a second quadrant of the restoration matrix after horizontally reversing the reference value matrix, to the elements of a third quadrant of the restoration matrix after vertically reversing the reference value matrix, and to the elements of a fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees;

a fifth reference value matrix addition unit which, according to the B-type symmetry, adds the fifth reference value matrix stored in the fifth reference value matrix computation storage unit to the elements of the first quadrant of the restoration matrix without change, to the elements of the second quadrant of the restoration matrix after horizontally reversing the reference value matrix and inverting the signs, to the elements of the third quadrant of the restoration matrix after vertically reversing the reference value matrix, and to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees and inverting the signs;

a sixth reference value matrix addition unit which, according to the C-type symmetry, adds the sixth reference value matrix stored in the sixth reference value matrix computation storage unit to the elements of the first quadrant of the restoration matrix without change, to the elements of the second quadrant of the restoration matrix after horizontally reversing the reference value matrix, to the elements of the third quadrant of the restoration matrix after vertically reversing the reference value matrix and inverting the signs, and to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees and inverting the signs; and

a seventh reference value matrix addition unit which, according to the D-type symmetry, adds the seventh reference value matrix stored in the seventh reference value matrix computation storage unit to the elements of the first quadrant of the restoration matrix without change, to the elements of the

second quadrant of the restoration matrix after horizontally reversing the reference value matrix and inverting the signs, to the elements of the third quadrant of the restoration matrix after vertically reversing the reference value matrix and inverting the signs, and to the elements of the fourth quadrant of the restoration matrix after rotating the reference value matrix by 180 degrees.

16.   The apparatus of claim 15, wherein excluding the first row or the first column of the restoration matrix, the elements included in the even-numbered rows have the D-type symmetry and the C-type symmetry in turn continuously and repeatedly, and the elements included in the odd-numbered rows have the B-type symmetry and the A-type symmetry in turn continuously and repeatedly.

17.   A computer readable medium having embodied thereon a computer program for a fast IDCT method comprising:

(a) searching all elements of a DCT matrix in a predetermined order for non-zero elements; and

(b) calculating a restored value of each element of a restoration matrix, by 2D-IDCT transforming the non-zero elements of the DCT matrix by using the symmetry of an IDCT formula.